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SECTION OF GEOLOGY AND MINERALOGY

MAY 1, 1939

PROFESSOR FREDERICK K. MORRIS, Massachusetts Institute of Technology: *The Pacific Ocean, Real and Maligned.* (This lecture was illustrated by lantern slides.)

The Pacific is by far the biggest of the earth's oceans. Its area is 2.3 times that of the Atlantic and 2.5 times that of the Indian Ocean. It is more consistently deep than any other; its floor, almost everywhere that tests have been made, yields positive anomalies indicating a floor of heavy rock, like basalt. Earthquake vibrations move faster under its floor than through any other equally shallow portion of the crust. The Pacific is bordered, especially on the west, by arc-shaped chains of mountains; and all students agree that the arc-structures extend far seaward, as in the Mariana and Bonine chains. On the American side a great contrast is observed; for none of the arcs lie out in the ocean; and not all the shore-line ranges are composed or structured like the Asiatic arcs; although all belong to the same mountain-making history. An active earthquake-belt coincides with the entire island-arc system, and the Pacific shores of the Asiatic continent itself are everywhere subject to earthquakes of less intensity than in the arcs. In contrast, the broad

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basins of the open ocean are almost free from strong shocks. Much less continuous than the earthquake belt is the girdle of volcanoes around the Pacific—often called the Ring of Fire. It is a striking feature, especially when contrasted with the paucity of volcanoes in other oceans and along their shores.

Out in the bowl of the Pacific three areas may be distinguished: a northern and a southern basin, each almost wholly devoid of islands; and a central belt studded with archipelagoes. These islands are all volcanoes whose lavas are generally though not exclusively basaltic. But westward toward Australia, continental islands are found; and here, according to Gutenberg, the Pacific floor behaves more like a continent than does any other portion of the vast basin.

These are elementary facts and widely published. What interpretations are offered for these facts, and how well do the inferences bear scrutiny? Osmund Fisher suggested, in 1876, that the Pacific basin is the birthplace of the moon; and William Pickering, in 1910, forcefully declared that there's no other place for the moon to come from. Many, perhaps most, geologists accept it; and Arthur Holmes offering the Lowell lectures in 1936 proclaimed it as undisputed truth; showing in a series of diagrams the birth of the moon, and the modern shapes of Asia and America rimming the new-born Pacific Ocean.

The thesis holds that the departing moon tore away the earth's granite skin, leaving the bare sima exposed; that the edges of the granite shell, trying to slide out into the hole, have wrinkled the island arcs out of the basin's floor; and that around and within the amputation-scar the earth has been bleeding basalt-juice. All facts are accounted for, including the positive gravitation-anomalies, and the fast travel-time of earthquakes.

But grave objections can be brought: Bryan and Love showed that the earth has never had sufficient energy to fling out the moon centrifugally; and if it had, several small moons rather than one so disproportionately large would have been born; for in relation to the earth, the moon is the largest satellite in the Solar System. Jeffreys rescued the theory by intro-

ducing the sun as a tidal obstetrician. He showed that at best the theory is just possible; and the moon could have parted from the earth only when the earth was wholly molten. Therefore, the moon's departure would not have left a Pacific Ocean basin, for the liquid sial would have flowed over the amputation. The date of the moon's departure must have been at a substantially pre-Archæozoic time; for the oldest Archæozoic sediments tell of an earth as cool and moist as it is today. As the island arcs and their adjoining deeps were shaped during middle and late Tertiary time, the birth of the moon was too early by a billion years to account for the present configuration of the Pacific; and probably that billion needs a coefficient. The volcanoes are all of late Tertiary and Pleistocene age; so they lend even less support to the moon-Pacific theory than do the arcs and deeps. The conclusion cannot be escaped: if the moon is the earth's child at all—which is not proved—its age alone wholly acquits the moon of having dug out the Pacific basin.

But if its age were not its alibi, the moon's size would be; for if the moon were put back into the earth it would fill all the ocean basins 36 miles deep, and make them higher than any continent. The Pacific basin is far too shallow to have borne the moon.

A second interpretation is the Taylor-Wegener hypothesis which holds that the Pacific formerly contained virtually all of the earth's ocean-water and that the drifting continents have encroached upon it, narrowing the Pacific as the Atlantic widened; and moving Australia far eastward to shut off the Indian Ocean. By this theory the arcuate mountains of the Pacific are wrinkles pushed up by the advancing edges of the sliding continents. DuToit has recently presented the thesis in an attractive but unconvincing book. It's true that the puzzling glaciation of the tropical southern continents would be explained; but the hypothesis causes more difficulties than it solves. The island arcs should be more abundant along the far-moving Americas than along the nearly stable Asia; yet the reverse is true. The arcs should be made of abyssal sediments,

wrinkled up out of the deep ocean; but instead they are shallow-water types and deep-sea deposits are rare. Europe and North America, Africa and South America could easily exchange plants and animals while they were joined together; but exchange across the Pacific was impossible, for even Bering Strait was 2,000 miles wide. But during Cretaceous time while the Atlantic was narrow and the Pacific broad, western America and eastern Asia had closely related plants and animals, many of which are not found in Europe.

I am no enemy of the theory of continental drift; but must defer accepting it until supporting evidence is found of the same weight as that which supports acceptable parts of geologic science.

Quite the worst malignment of the good Pacific is the highly popular thesis that a continent inhabited by civilized men existed in the Pacific; that the ancient cultures of India, Egypt and America were derived from it. The thesis exploits the natural parellelisms between the artistries of these widely separated regions, and gilds its inconsistencies with assertions as sweeping as those of the Bible. The absence of continent and culture is due to sudden foundering that destroyed all but the remnant-crags which now form the mid-ocean archipelagoes. Were it not for the widespread popular acceptance of this thesis, I would not have reviewed it before the Academy; but I find that not only intelligent laymen but even some scientists take it seriously.

If it were true, we should find that the races in America and Asia were descended from the peoples still living in the island-remnants of the original Pacific homeland; for it is loudly claimed that the islanders are the naked survivors of the catastrophe. Instead we find them diverse, each from each; and we see clear evidence that the peoples of all three regions are Asiatic stocks, or mixtures of stocks; and that all migrated from Asia at diverse stages of a long and complex history. The islands, instead of being crags left by the rifting of a sunken continent, are volcanoes built up by successive, orderly lava-

flows until they now stand above the ocean. Their proven history as volcanic islands is far longer than their supposed history as crags; that is, they were normal oceanic islands long before the human history of the Pacific continent is postulated; and several million years before the American and Asiatic civilizations which the protagonists claim were derived from the Pacific land before its catastrophe. The statues on Easter Island are known to be Polynesian work, and give no support to the thesis of a vanished continent.

SECTION OF BIOLOGY

MAY 8, 1939

DOCTOR CARL G. HARTMAN, Johns Hopkins University School of Medicine: *The Physiology of Ovulation.* (This lecture was illustrated by lantern slides and motion pictures.)

1. *Physiological factors involved*

Ovulation in mammals has been attributed solely to intrafollicular pressure, which supposedly resulted in rupture of the follicle when it attained a certain degree of pressure. Sudden rise in pressure has been attributed to (a) swelling of theca interna; (b) local increase in blood pressure; (c) contraction of smooth muscle fibers of the theca externa; (d) preovulatory secretion of liquor folliculi. This "intrafollicular pressure" theory has proved inadequate, for injured follicles may become cystic yet fail to rupture despite high internal pressure. An alternative theory (Hartman in Allen's *Sex and Endocrine Glands,* 1932) views ovulation as the result of an orderly series of changes in the cellular wall of the follicle under the stimulus of the anterior pituitary gland, as has been known since Philip E. Smith's epoch-making discovery of the pituitary-gonadal relationship. After the follicle wall has thinned sufficiently, it opens at the "stigma" without violence—there are no jagged edges at the "rupture point," as had already been noted for Cryptobranchus as well as birds. In principle the new theory holds for all the vertebrate classes.

That ovulation in mammals is not a cataclysmic process was demonstrated by means of the Yale motion picture of ovulation in the rabbit shown at the end of the lecture.

The rôle of the hypophysis in ovulation has been proved in various ways, for example, by hypophysectomy and by substitution therapy. One of the most interesting chapters of the subject, however, concerns the avenue by which nerve impulses reach the anterior pituitary. To elucidate this problem the

rabbit is the subject of choice, for the rabbit female does not normally ovulate except after coitus. Parenthetically it may be stated that the ferret and the cat belong to the same behavioral type; all other mammals ovulate spontaneously. The lecturer raised the question as to whether in the other vertebrate classes one could make a similar distinction. As an example the dove and the hen were contrasted. More experimental work is needed on the lower vertebrates—an expansion of the type of researches carried on by G. Kingsley Noble and his associates at The American Museum of Natural History.

In the rabbit it has been shown that nerve impulses of coitus must reach the pituitary. This may be done, as the lecturer has, by direct electrical stimulation of the gland. Ovulation follows. It likewise follows stimulation of the central end of the cut spinal cord, but not of the distal end. Direct stimulation of the ovary has no effect. Ovulation is, therefore, hormonally conditioned. Even though the cord is cut and the cerebral hemispheres and the sympathetic chain removed, a vigorous male may yet cause ovulation in such a female through attempts at mating. Finally, after the stalk of the pituitary has been severed, with no other damage to the animal, she may copulate a great deal but will never ovulate.

Induction of ovulation in animals that remain sterile because of failure to ovulate has thus far not been found to be very successful. The lecturer related his experiences with non-ovulating monkeys and was able to report success in but few cases, by the use of gonadotropic substances. The chief difficulty lies in gauging the correct dosage: too little is ineffective, too much injures the follicles which become cystic without rupturing.

2. *The time of ovulation in the cycle*

Exact data as to time of ovulation with reference to easily recognizable signs, such as changes in the cellular content of the vagina, overt sex behavior (sexual receptivity) or the menstrual flow, has been worked out with exactitude in only a few forms. In the mouse, rat, guinea-pig and opossum ovulation is

only fairly well related to the beginning of the "cornified smear." In the guinea-pig the time relation of ovulation is more precise with reference to the time of acceptance of the female, namely 10 hours after the beginning of heat, whether coitus takes place or not. The rabbit, as is well known, ovulates 10 hours after coitus. Hence it is the classical animal for numerous lines of researches in physiology and embryology.

Of especial interest is the time of ovulation in women. Up to the present there are several tests to show that ovulation has occurred, namely: (1) endometrial biopsies; (2) analysis of pregnandiol in the urine; (3) inspection of ovaries at laparotomy. None of these make exact timing possible but offer presumptive evidence of a limited fertile period in the menstrual cycle. That the last method is the most unreliable of the three the lecturer illustrated by photographs of the monkey ovary removed at various times after accurately determined ovulations.

In the monkey, ovulation has been determined by means of (1) isolated coitus, under strict control; (2) palpation of the ovaries; (3) recovery of a hundred eggs and embryos. The monkey has a limited period of fertility. Similarly, absolutely proved data are almost non-existent for man. What few young ova have been recovered from women were all ovulated within the fertile period determined for the monkey. Not a single case of ovulation, accompanied with adequate proof, has been reported outside this period, the lecturer stated.

A motion picture of the dividing monkey ovum in tissue culture closed the lecture.

SECTION OF PSYCHOLOGY

May 15, 1939

Lawrence K. Frank, Josiah Macy, Jr., Foundation, New York, N. Y.: *Projective Methods for the Study of Personality.*

In view of the confusion and conflicts over concepts and methods for study of personality, it is suggested that we view the emergence of personality as an outcome of the interaction of cultural agents and the individual child. In this process we see parents and teachers attempting to train the child in the prescribed social and cultural norms of action, speech and belief which he accepts with varying degrees of conformity and with feelings that permeate all his behavior. Thus the child is socialized but also individualized, so that he acts, speaks, believes and feels idiomatically.[1]

The problem of personality then is to devise procedures for revealing how the *individual* organizes and patterns experience and behavior and reacts affectively to situations idiosyncratically, as contrasted with the task of measuring his conformity to social norms through standardized tests of known validity and reliability for the age and sex *groups* to which individuals are assigned.

Recent scientific developments have shown that underlying the apparent uniformity and regularity of aggregates, individual particles, atoms, molecules and organisms are disorderly and unpredictable. Furthermore, the field concept is being used to conceptualize the part-whole relationships as a dynamic process of interacting parts that create the whole and thereby pattern their individual activities. These and other developments have shown the fallacy of reifying data into entities and the importance of studying the total unified substance or

[1] Frank, Lawrence K. The Fundamental Needs of the Child. *Mental Hygiene*, Vol. XXII, No. 3, July, 1938.

Frank, Lawrence K. Cultural Coercion and Individual Distortion. *Psychiatry*, Vol. II, No. 1, February, 1939.

organism which the older analytic methods disintegrated or destroyed.

X-rays, diffraction analysis, spectroscopic methods, polarized light, light reflections, biological assays, the Wilson Cloud Chamber, and similar procedures are being employed to discover the chemical composition and the internal structure and organization of any substance or organism and the behavior of individual particles, or parts of larger aggregates. These methods offer possibilities for revealing what is either unknowable by other means or undeterminable by the older analytic methods which disintegrated or destroyed the object under study. They indicate that it is possible to study the specific, differentiated individuality of organized structures and particulate events which are ignored or obscured by the older quantitative determinations of aggregates.

It is important to note that the reliability and the validity of these methods are determined, not by statistical procedures, but by genetic and experimental operations, that is, by using substances or structures of known composition, often made to order, so that the diffraction pattern, spectroscopic lines, etc., are established as reliable and valid indicators when found in an unknown substance or organization. The validity of these methods is also established by the concurrent use of several different procedures which yield consistent and congruous findings on the same substance or subject under study. These procedures are being increasingly used and refined because the early quantitative methods, which merely told what and how much, are too crude and inadequate to reveal not only the constituents but the spatial arrangements, as in stereochemistry. These methodological advances and the conceptions of individuality and of individuation are being accepted as investigators endeavor to reveal the range of individual differences as in the protein molecules.

The foregoing description of recent scientific developments provides a useful background and gives scientific sanction for the study of personality as a *process* of organizing experience and "structuralizing the life space" (Lewin) in a *field* which

may be conceived in terms of the individual's private world of meanings, significances, patterns and feelings, which he endeavors to impose upon all life situations. This conception offers an approach to the study of personality as a task of inducing the individual to reveal his way of organizing experience by giving him a field (objects, materials, experiences) with relatively little structure and cultural patterning, so that the personality can project upon that plastic field his idiomatic, idiosyncratic personality.[2]

Specifically, a projection method for the study of personality involves the presentation of a stimulus-situation designed or chosen because it will mean to the subject, not what the experimenter has arbitrarily decided it should mean (as in most psychological experiments using standardized stimuli in order to be "objective"), but rather whatever it means to the personality who gives it or imposes upon it his private, personal organization and needs. Projective methods for this purpose vary in materials used and in what they may elicit from subjects, as in the Rorschach ink blots, and Stern cloud pictures, in play technic, in clay, finger paints, and art expressions generally, the telling or completion of stories, in handwriting and motor adjustments, and postures, and so on. These methods may be tested for validity by the method of *temporal validation* whereby the validity of the method for an *individual,* instead of the group, is discovered by using the procedure upon the individual over a period of time sufficient to show that the personality organization thus revealed is a persistent and valid configuration for that individual. The reliability of these methods for an *individual,* not the group, may be tested by the congruity and consistency of results obtained by a variety of these procedures applied to the same individual, whereby the basic personality configuration of the individual is confirmed.

It will be seen therefore that projective methods for personality study are contrasted with the present quantitative

[2] Horowitz, Ruth, and Lois Barclay Murphy. Projective Methods in the Psychological Study of Children. *Journal of Experimental Education,* Vol. 7, No. 2, December, 1938.

procedures which attempt to measure correlations or establish factors by statistical manipulation of supposedly separate variables or traits measured on a large group of individuals at one moment in their life careers.

It may be emphasized that projective methods are not offered as a substitute for the quantitative statistical procedures but rather are designed to permit a study of the unique idiomatic individual personality which is conceived as a process of organizing experience and so must elude the investigator who relies upon methods that of necessity ignore or obscure the individual and the configural quality of his personality. Finally, it should be noted that projective methods of personality study offer possibilities for utilizing the insights into human conduct and personality expression which the prevailing quantitative procedures seem deliberately to reject.

Note: The full paper and an extended bibliography on projective methods will be published in one of the psychological journals during 1939.

The New York Academy of Sciences

announces the

A. Cressy Morrison Prizes for 1939

Two prizes of $200 each, offered by Mr. A. Cressy Morrison, to be known as the A. Cressy Morrison Prizes in Natural Science, will be awarded at the Annual Dinner, December, 1939, for the two most acceptable papers in a field of science covered by the Academy or an Affiliated Society. These papers must embody the results of original research not previously published.

Conditions:

(1) Eligibility. Membership in good standing of The New York Academy of Sciences or one of the Affiliated Societies, prior to submission of the manuscript.

(2) Date. Papers are to be submitted on or prior to November 1, 1939, to the Secretary of The New York Academy of Sciences at The American Museum of Natural History, Central Park West at 79th Street, New York City.

(3) Papers. The manuscript shall be typewritten, in English, accompanied by all necessary photographs, drawings, diagrams and tables, and shall be ready for publication.

It is suggested that papers submitted for the prizes be accompanied by a summary of the data presented and conclusions reached.

(4) Awards. The awards shall be made by the Council of The New York Academy of Sciences. If, in the opinion of the judges, no paper worthy of a prize is offered, the awards of a prize or prizes will be omitted for this contest.

(5) Publication. The Academy shall have first option on the publication of all papers submitted, unless especially arranged for beforehand with the authors, but such publication is not binding on the Academy.

(6) Wherever and whenever published, the papers awarded the prizes shall be accompanied by the statement: "Awarded an A. Cressy Morrison Prize in Natural Science in 1939 by The New York Academy of Sciences." This statement in substance must also accompany any formal publicity initiated by the author regarding the prize paper. If published elsewhere, six copies of each prize paper must be deposited shortly after publication with the office of The New York Academy of Sciences.

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Elected May 1, 1939

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Wright, W. H., D.V.M., Ph.D., National Institute of Health, Washington, D. C.

STUDENT MEMBER

Merrill, J. Edwerta, A.M., Dept. of Zoology, Barnard College, New York, N. Y.